

DETAILED ACTION***Response to Amendment***

1. This office action is in response to the amendment filed on January 9, 2012 submitted in response to the BPAI Decision on November 8, 2011. Claims 1 and 3-10 are pending and are rejected for reasons of record. Claim 1 has been amended. Claims 9-10 are new. Claim 2 is cancelled.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamoto et al. (JP 2002-124297) in view of Noh (US 2004/0101762) and Nirasawa et al. (US 2002/0018940).

With regard to claims 1 and 8-10, Noh teaches a nonaqueous electrolyte secondary battery comprising a carbonaceous negative electrode and a positive electrode, each of which permits reversible insertion and desorption of lithium, a separator separating the positive and negative electrodes from each other, and a nonaqueous electrolyte solution comprising an organic solvent, a lithium salt solute, an additive compound having at least two carbonate groups, and a secondary additive which can be vinylene carbonate (VC) in an amount 0.1-50wt%, preferably 0.1-10 wt%

(paragraphs [0013], [0020]-[0021], & [0039]). Noh further teaches that the electrolyte solution improves cycle life and inhibits swelling at high temperature (paragraph [0011]).

Hamamoto et al. teaches a lithium secondary battery comprising a positive electrode and carbonaceous negative electrode which can occlude and discharge lithium, a separator separating the positive and negative electrodes from each other, and a nonaqueous electrolyte solution comprising an organic solvent, a lithium salt solute, and an alkyne derivative which can be di(2-propynl oxalate) (D2PO) in a preferred amount of 0.1-10wt% (paragraphs [0008]-[0009], [0016]-[0021], and [0025]-[0026]). Hamamoto et al. further teaches that the organic solvent can comprise vinylene carbonate (paragraphs [00018]-[0019]). Hamamoto et al. further teaches that the alkyne derivative coats the surface of the carbonaceous negative electrode, thereby preventing reduction and decomposition of the organic solvent at the electrode which would reduce the battery's cycle, electrical capacity, and storage properties (paragraphs [0003]-[0004] and [0011]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include any amount within Hamamoto's 0.1-10wt% of di(2-propynl oxalate), such as 0.1-3wt%, in Noh's electrolyte solution to obtain the benefit thereof taught by Hamamoto, i.e. coating the carbonaceous negative electrode so as to prevent reduction and decomposition of the organic solvent at the electrode and thereby improve the battery's cycle, electrical capacity, and storage properties (Hamamoto, paragraphs [0003]-[0004] and [0011]). Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute Noh's organic solvent/additive/secondary additive, including combinations wherein the secondary

additive is vinylene carbonate in an amount within the preferred 0.1-10wt%, such as 0.1-3wt%, for Hamamoto's organic solvent which can comprise esters and vinylene carbonate and to which the alkyne derivative is added (paragraphs [0018]-[0019] and [0021]), to obtain the benefit of that combination taught by Noh, i.e. improved battery cycle life and inhibited swelling at high temperature (paragraphs [0020]-[0021] and [0039]).

Furthermore, one of ordinary skill in the art would understand that because the nonaqueous electrolyte contains 0.1-10wt% of di(2-propynl oxalate) by mass relative to the mass of said nonaqueous electrolyte and contains 0.1-50wt%, preferably 0.1-10wt%, of VC by mass relative to the mass of said nonaqueous electrolyte, the claimed ratio of VC to di(2-propynl oxalate) of 1:20 to 1:30 is fully encompassed by the ranges taught by modified Noh.

Modified Noh fails to teach the packing density of said negative electrode active material.

Nirasawa et al. teaches a lithium secondary battery comprising a positive electrode and graphitic / carbonaceous negative electrode which can occlude and discharge lithium, a separator separating the positive and negative electrodes from each other, and a nonaqueous electrolyte solution (paragraphs [0016]-[0017] and [0059]). Nirasawa et al. further teaches that it is advantageous for the graphite / negative electrode active material to have a bulk packing density 0.4g/cm^3 or more, preferably 0.6g/cm^3 or more, (i.e., 0.4g/ml or more, preferably 0.6g/ml or more) thereby allowing the negative electrode material to not separate from the negative electrode

active material layers, thus achieving an improved electrode configuration and allowing the battery to have a longer cycle life (paragraph [0059]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the concept of the graphitic / carbonaceous active material of a negative electrode having a bulk packing density $0.4\text{g}/\text{cm}^3$ or more, preferably $0.6\text{g}/\text{cm}^3$ or more, (i.e., $0.4\text{g}/\text{ml}$ or more, preferably $0.6\text{g}/\text{ml}$ or more) of Nirasawa et al. to the carbonaceous negative electrode of modified Noh solution to obtain the benefit thereof taught by Nirasawa et al., i.e. thereby allowing the negative electrode material to not separate from the negative electrode active material layers, thus achieving an improved electrode configuration and allowing the battery to have a longer cycle life (paragraph [0059]).

4. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamoto et al. (JP 2002-124297), Noh (US 2004/0101762), and Nirasawa et al. (US 2002/0018940), as applied to claim 1 above, and further in view of Kanekiyo et al. (JP 2002-313419).

Regarding claims 3-6, Noh teaches that the negative electrode active material can be a carbonaceous material (paragraph [0020]) and that the nonaqueous electrolyte can comprise DMC, DEC, MEC/EMC, and/or EC (paragraph [0026]), but fails to specifically state the amount of DEC, and EC used.

Kanekiyo et al. teaches the concept of a nonaqueous electrolyte comprising 25-40vol% EC, 25-60vol% MEC/EMC, and 10-40vol% DEC (paragraphs [0006], [0011]-

[0012], [0029]) in order to optimize the ionic conductivity / electric property of said nonaqueous electrolyte (paragraph [0012]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the concept of a nonaqueous electrolyte containing 25-40vol% EC, 25-60vol% MEC/EMC, and 10-40vol% DEC of Kanekiyo et al. to the nonaqueous electrolyte of modified Noh to obtain the benefit thereof taught by Kanekiyo et al., i.e. to optimize the ionic conductivity / electric property of said nonaqueous electrolyte (paragraph [0012]).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamoto et al. (JP 2002-124297), Noh (US 2004/0101762), and Nirasawa et al. (US 2002/0018940), as applied to claim 1 above, and further in view of Kinoshita et al. (US 2004/0091780).

With regard to claim 7, modified Noh fails to teach a metallic case with the specified thickness.

Kinoshita et al. teaches the concept of deploying a nonaqueous secondary battery inside a metallic case, wherein said metallic case can be made from an aluminum alloy sheet having the thickness of 0.5mm or less (paragraph [0034] & claim 2) in order to provide an airtight environment for said nonaqueous electrolyte battery (abstract) and thereby prevent said electrodes and said electrolyte from being exposed to contaminants.

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the metallic case having a thickness of 0.5mm or less of Kinoshita et al. to the nonaqueous secondary battery of modified Noh to obtain the benefit thereof taught by Kinoshita et al., i.e. to provide an airtight environment for said nonaqueous electrolyte battery (abstract) and thereby prevent said electrodes and said electrolyte from being exposed contaminants.

Response to Arguments

Claim Rejections - 35 USC § 103

6. Applicant's arguments with respect to claims 1 and 3-10, filed on January 9, 2012, have been considered but are moot in the view of the new ground(s) of rejection. The new grounds of rejection are necessitated by the Applicants amendment and all arguments are directed toward the added feature of 1) amending claim 1 to recite that a packing density of the negative electrode active material is 1.5g/ml or higher, and 2) adding new claims 9-10.

7. Applicant's arguments with respect to claims 1 and 3-10, filed on January 9, 2012, have been considered but are not persuasive.

On page 5 of the Applicant's Response, Applicants argue that "the battery of amended claim 1 has more than 1.5g/ml of electrode packing density, and it shows a remarkable effect of providing a high capacity battery without degrading

charge/discharge characteristics and increasing battery swelling. The effect is brought by addition of vinylene carbonate (VC) and di(2-propynyl) oxalate (D2PO). Table 3 and [0050] of the present specification clearly shows that the more the electrode packing density is higher, the more saliently effects of adding VC and D2PO to the electrolyte is manifested" (Applicant's Response, page 5).

The Examiner respectfully disagrees with the Applicants argument "the battery of amended claim 1 has more than 1.5g/ml of electrode packing density, and it shows a remarkable effect of providing a high capacity battery without degrading charge/discharge characteristics and increasing battery swelling. The effect is brought by addition of vinylene carbonate (VC) and di(2-propynyl) oxalate (D2PO). Table 3 and [0050] of the present specification clearly shows that the more the electrode packing density is higher, the more saliently effects of adding VC and D2PO to the electrolyte is manifested" (Applicant's Response, page 5) because:

1) The Applicant's showing of unexpected results does not provide a comparison of the claimed invention with the closes prior art (see new rejection above due to amendment). See *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991); *In re Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984). The Applicants have not identified the closest prior art and compared it to, or explained why their comparative examples are closer than the closest prior art;

2) It is not enough for the Applicants to show that the results for the Applicant's invention and the comparative examples differ. The difference must be shown to be an unexpected difference. See *In re Freeman*, 474 F.2d 1318, 1324 (CCPA 1973); *In re*

Klosak, 455 F.2d 1077, 1080 (CCPA 1972). The Applicants' Specification does not state that the comparative results therein would have been unexpected by one of ordinary skill in the art. The Applicants have provided mere attorney arguments to that effect, and arguments of counsel cannot take the place of evidence. See *De Blauwe*, 736 F.2d at 705;

3) It has been held that "to establish unexpected results over a claimed range, applicants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range" (*In re Hill*, 284, F.2d 955, 128 USPQ 197 (CCPA 1960) & MPEPE 716.02(d)(II)). Furthermore, it has been held that "an affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a *prima facie* case of obviousness (MPEP 716.02); and

4) The fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Int. 1985).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CLAIRE L. ROE whose telephone number is (571)272-9809. The examiner can normally be reached on Monday-Friday 9:30AM - 5:30PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on 571-272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C. L. R./
Examiner, Art Unit 1727

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